DESCRIPTION

CLEANING GAS

TECHNICAL FIELD

The present invention relates to a cleaning gas suitable for use in production of semiconductors.

BACKGROUND ART

Perfluoro compounds such as CF_4, C_2F_6, C_4F_8 (perfluorocyclobutane) and SF_6 are used in large amounts as cleaning gases for plasma CVD chambers in production of semiconductors. Since the perfluoro compounds are stable and have long atomospheric lifetimes and high infrared absorbency, they have extremely high global warming potential (GWP) as compared with carbonic acid gas. CF_4 is 6300 times, C_2F_6 is 1250 times, C_4F_8 is 9100 times and SF_6 is 24900 times as high as carbonic acid gas in GWP. Therefore, development of a substitute gas having a low global warming potential is an urgent task.

An object of this invention is to provide a substitute gas which is suitable for use as a cleaning gas for plasma CVD chambers in production of semiconductors, the gas having a low global warming effect.

DISCLOSURE OF INVENTION

The present invention provides the following cleaning gas and cleaning method:

1. A chamber cleaning gas comprising at least one gas selected from the group consisting of $CF_3CF=CF_2$, $CF_3CF\text{-}CF_2$ (O) and $CF_3C(=O)CF_3$.

2. A chamber cleaning method comprising cleaning a plasma CVD chamber of a semiconductor integrated circuit production device using at least one gas selected from the group consisting of $CF_3CF=CF_2$, $CF_3CF\text{-}CF_2$ (O) and $CF_3C(=O)CF_3$.

As the chamber cleaning gas of the invention, any of $CF_3CF=CF_2$, $CF_3CF\text{-}CF_2$ (O) and $CF_3C(=O)CF_3$ can be used; they can be used singly or in combination of two or more. The chamber cleaning gas of the invention may be used in combination with a monomer gas such as He, Ne, Ar, H_2, N_2 or O_2.

There is no limitation on materials of the chamber. The chamber may be made of known materials such as stainless steel or aluminum alloy. Without adversely affecting the materials of the chamber, the chamber cleaning gas of the invention can quickly remove reaction byproducts attached to the wall of the chamber.

Examples of byproducts removed by the cleaning method of the invention are silicon, polysilicon, tungsten, titanium and their oxides, nitrides and

carbides.

As the chamber cleaning conditions of the invention, conventional conditions using perfluoro compounds may be used as they are.

All the three kinds of chamber cleaning gases of the invention have satisfactory levels of properties so that they can be used as substitutes for conventionally used chamber cleaning gasses, namely, CF_4, C_2F_6 and SF_6. Moreover, the gases of the invention have much lower global warming potential than CF_4, C_2F_6 and SF_6.

For example, when used under known chamber cleaning conditions (pressure = 100 m Torr; input high-frequency power = 300 W; gas flow rate = 50 cc/min) for 30 minutes, $CF_3CF=CF_2$ of the invention fully and quickly removes attached byproducts from the chamber without damaging the chamber. Thus $CF_3CF=CF_2$ of the invention is suitable for use in practice.

When $CF_3\underset{\diagdown O \diagup}{CF\text{-}CF_2}$ is used in place of $CF_3CF=CF_2$ under the above conditions, $CF_3\underset{\diagdown O \diagup}{CF\text{-}CF_2}$ fully and quickly removes attached byproducts from the chamber without damaging the chamber, thus being usable in practice.

Similarly, when $CF_3\underset{CF_3}{\overset{|}{C}}=O$ is used in place of

$CF_3CF=CF_2$, $CF_3\underset{\underset{CF_3}{|}}{C}=O$ fully and quickly removes attached byproducts from the chamber without damaging the chamber, thus being usable in practice.

According to the present invention, chamber cleaning can be done satisfactorily, without using any of CF_4, C_2F_6, C_4F_8 and SF_6 that have extremely high global warming potential as compared with carbonic acid gas.